REMARKS

Claims 1-49 are pending in the application. Claims 1-35 have been rejected and claims 36-49 are withdrawn. Claims 1 and 12 have been amended. No new matter has been added. Reconsideration of the claims, in view of the comments provided below, is respectfully requested.

Claims 1 and 12 have been amended to clarify that the heights of the first and second side portions are to be taken at one point along the waveguide. It is believed that this clarification does not reduce the scope of the claims. No new matter has been entered.

Elections/Restrictions

Applicants affirm the election of Group I (claims 1-35), without traverse.

Rejections Under 35 U.S.C. § 102

Claims 1-4, 11, 19-22 and 25 are rejected under 35 U.S.C. § 102(e) as being anticipated by Matsumura (U.S. Patent Publication No. 2003/0128729 A1). Matsumura teaches a ridged-type semiconductor laser device in which the characteristics of the ridge vary along the waveguide of the laser. In FIG. 1A, the laser is shown to have two stripe regions, C1 and C2. The ridge (20) is shown to have an even height along its length, but the height of the material to the side of the ridge is set at different heights in regions C1 and C2. Thus, the confinement of the light in the waveguide varies along the length of the laser, and it is the difference in confinement of the two axial areas, C1 and C2, that is used to provide mode control for the laser light.

To anticipate a claim, the reference must teach every element of the claim. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628,631, 2 USPQ2d 1051 1053 (Fed. Cir.) 1987). "The identical invention must be shown in as complete detail as is contained in the...claim." Richardson v. Suzuki Motor Co., 868 F. 2d1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Therefore, if a reference does not teach every element of the claim, then the reference does not anticipate the claim (see MPEP § 2131). Applicants respectfully assert that Matsumuru fails to teach all the elements of the claims.

Independent Claim 1

The invention of claim 1 is directed to a semiconductor optical device that has a substrate and first and second semiconductor side regions formed over the substrate. A semiconductor ridge is disposed between the first and second side regions and over the substrate forming an optical waveguide within the device. The height of the semiconductor ridge above the substrate is greater than the heights of the first and second side regions above the substrate. The height of the first side region above the substrate, at a point along the waveguide, is different from a height of the second side region above the substrate, at the point along the waveguide.

It is asserted in the Office Action that FIGs. 2B-D show the asymmetry of the waveguide structure, in particular that the first side region has a height above the substrate that is different from the height of the second side region above the substrate. This characterization of Matsumura is mistaken. It should be first noted that Matsumura teaches a system in which the height of the ridge is varied axially, i.e. along the laser axis, for mode control, and is not varied between different sides of the ridge.

In FIGs. 2B-2D, and in the description thereof in paragraph [0095], Matsumura initially emphasizes that

> "[the] characteristics of the device vary significantly depending on the width Sw of the strip, the height of the ridge (depth of the strip) Sh_1 and the distance Sh_2 between the surface exposed by etching and the top plane of the active layer as shown in FIG. 2B. These factors cause serious variations in the device characteristics during production thereof. That is, the variations in the device characteristics are caused directly by error Hd in the height of the ridge (depth of the strip) and error Wd in the width of the stripe related to the accuracy of the etching shown in FIG. 2C and 2D."

FIG. 2B shows a schematic sectional end view of the laser device, showing the mask (20) on top of the ridge etched into the cladding layer (7). The thickness of the unetched portion of the cladding layer (7) on either side of the ridge is highlighted in circle (a) and is shown in expanded form in FIG. 2C. The error Hd is shown in the FIG. 2C as a thickness variation. The base of the ridge is highlighted in circle (b) and is shown in expanded form in FIG. 2D.

Matsumura continues in paragraph [0095], stating:

> "This is because the waveguide region formed in the active layer (waveguide layer) is provided by making use of the effective difference in refractive index corresponding to the ridge 202 by means of the stripe ridge provided in the active layer (waveguide layer), and therefore the configuration of the ridge has a

> significant influence on the effective difference in refractive index. The error Hd in the height of the ridge is also the error in the distance between the surface exposed by etching and the tope plane of the active layer. When the distance Sh2 between the top plane of the active layer and the surface exposed by etching is too large, the effective difference in refractive index becomes smaller resulting in significant influences on the device characteristics such as insufficient confinement of light. As described above, since the effective refractive index is dependent on the distance Sh2 between the top plane of the active layer and the surface exposed by etching, variations in the distance cause the variations in the effective refractive index."

Thus, contrary to the assertion made in the Office Action, Matsumuru does not discuss, or anywhere suggest, that the ridge waveguide is asymmetric. Instead, Matsumura merely discusses the effects of the tolerances on the dimensions of the ridge and describes how important it is to that the ridge is fabricated with small errors in its dimensions so that the desired optical characteristics are achieved. Although FIG. 2B shows circle (a) (describing Hd) on the left side of the drawing and circle (b) (describing Wd) on the right side of the drawing, it is understood that the separation between these circles is only for the purposes of clarity, and not because it is expected that the height error, Hd, is present only on one side of the ridge and that the width error, Wd, is present only on the other side of the ridge. These errors are errors in fabrication (etching) and, since etching is carried out using a mask, these errors would naturally be symmetrical. There is nothing to suggest, for example, that the height error, Hd, takes place on only one side of the ridge.

Additionally, the schematic of the device itself, FIG. 2B, does not show any asymmetry in the ridge waveguide and it is only those drawings showing the undesirable errors in the waveguide dimensions, FIGs. 2C and 2D, that the Examiner has used to argue that Matsumura teaches an asymmetric waveguide.

To conclude, Matsumura nowhere suggests that the ridge waveguide be asymmetrical and, in fact, teaches that the errors Wd and Hd should be minimized in order to achieve the desired optical performance. Accordingly, Matsumura fails to teach that the height on one side of the ridge is different from the other, and so fails to teach all the elements of claim 1. Claim 1 is, therefore, novel over Matsumura.

Independent Claim 19

Independent claim 19 is directed to a semiconductor laser that includes a substrate having an upper surface in which a lateral direction is defined parallel to the upper substrate surface. One or more superstrate layers are provided on the substrate. An optical waveguide is disposed over the substrate to guide light passing between ends of the substrate and defining a fundamental optical mode. The first and second sides of the optical waveguide provide optical confinement in the lateral direction. The optical confinement for the fundamental optical mode provided on the first side of the optical waveguide is different from the optical confinement provided on the second side of the optical waveguide.

In a manner similar with that discussed above with respect to claim 1, Matsumura fails to teach that the ridge waveguide provides optical confinement that is different on one side of the waveguide compared with the other, i.e. that the optical confinement is asymmetrical. Matsumura's description is completely silent as to the use of an asymmetric waveguide. Instead, Matsumura teaches that the errors Wd and Hd should be minimized in order to achieve the desired optical performance. Matsumura fails to teach that the height on one side of the ridge is different from the other, and also fails to provide any other reason as to why the degree of confinement on one side of the ridge waveguide may be so different from that on the other side of the waveguide. Thus, Matsumura fails to teach all the elements of claim 19 and claim 19 is, therefore, novel over Matsumura.

Dependent Claims

Dependent claims 2-4, 11, 20-22 and 25, which depend from claims 1 and 19 and further define the inventions of claims 1 and 19, were also rejected under 35 U.S.C. §102(e) as being anticipated by Matsumura. While Applicants do not acquiesce with the particular rejections to these dependent claims, it is believed that these rejections are moot in view of the remarks made in connection with independent claims 1 and 19. Therefore, dependent claims 2-4, 11, 20-22 and 25 are also in condition for allowance.

Rejection under 35 U.S.C. § 103(a)

Claims 5, 6, 9, 10, 12-15, 23, 24 and 27-32 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hamakawa et al. (U.S. Patent No. 5,993,073) (Hamakawa) in view of Matsumura. It is stated that Hamakawa teaches an optical transmitter, a fiber optic link, an optical receiver and a laser coupled to inject light into the fiber optic link. It is also stated that Hamakawa fails to teach a laser having an asymmetric ridge waveguide but that Matsumura teaches such a laser and that it would be obvious to use such a laser because it provides stable control of the transverse mode and is capable of emitting a laser beam of excellent far field pattern with less variations in the device characteristics even when mass produced.

Three criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. Second, there must be a reasonable expectation of success. Finally, the prior art reference, or combination of references, must teach or suggest all the claim limitations. MPEP § 2142. Applicant respectfully traverses the rejection since the proposed combination of prior art fails to disclose all the claim limitations.

Applicants respectfully disagree with the Examiner's assertion that Matsumura explicitly teaches an asymmetric ridge waveguide laser. As has been discussed above, Matsumura fails to teach or suggest that the ridge is asymmetric, but teaches instead that the fabrication errors Hd and Wd should be reduced so as to produce a device having the desired optical characteristics. Hamakawa fails to remedy the deficiencies of Matsumura. Hamakawa teaches a laser module that can be used with a fiber optic system. There is no teaching or suggestion, however, that the laser module contains a laser having an asymmetric ridge waveguide.

Independent claims 12 and 29

Independent claims 12 and 29 contain lasers similar to those claimed in claims 1 and 19 respectively. Thus, since the asymmetric ridge waveguide lasers in claims 12 and 29 are not taught or suggested in either of the proposed references, independent claims 12 and 29 are patentable over the proposed combination of Hamakawa and Matsumura.

Dependent Claims

Dependent claims 5, 6, 9, 10, 13-15, 23, 24, 27, 28, and 30-32, which depend from claims 1, 12, 19 and 29, and further define the inventions of claims 1, 12, 19 and 29, were also rejected under 35 U.S.C. §103(a) as being unpatentable over the proposed combination of Hamakawa and Matsumura. While Applicants do not acquiesce with the particular rejections to these dependent claims, it is believed that these rejections are moot in view of the remarks made in connection with independent claims 1, 12, 19 and 29. Therefore, dependent claims 5, 6, 9, 10, 13-15, 23, 24, 27, 28, and 30-32 are also in condition for allowance.

Dependent claims 8, 16-18, 26 and 33-35 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the proposed combination of Hamakawa and Matsumura, and further in view of Mizrahi (U.S. Patent No. 5,673,129). It is stated in the Office Action that Hamakawa and Matsumura fail to teach the use of control circuitry to control and modulate operation of one or more transmitter lasers in response o incoming information, multiplexers and demultiplexers, multiplexing of signals of at least two transmitter signals and demultiplexing that signal to component signals that are received by respective detectors. It is further stated that Mizrahi teaches these missing elements and that it would have been advantageous to include these elements, and thus it is obvious to modify a device as taught by Hamakawa and Matsumura in view of Mizrahi.

Applicants respectfully contend that Mizrahi fails to remedy the deficiencies of the combination of Hamakawa and Matsumura, and that none of the three proposed references teach or suggest the use of an asymmetric ridge waveguide. Accordingly, claims 8, 16-18, 26 and 33-35 are patentable.

Conclusion

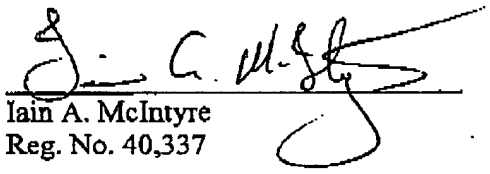
In view of the amendments and reasons provided above, it is believed that all pending claims are in condition for allowance. Applicant respectfully requests favorable reconsideration and early allowance of all pending claims.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicant's attorney of record, Iain A. McIntyre at (612) 436-9610.

Respectfully submitted,

CCVL
Customer No. 38846

Date: July 7, 2005

By: 
Iain A. McIntyre
Reg. No. 40,337